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PRAGITIUS AF N.A.C.A.  
AND  
COMPUTING GROUP ORGANIZATION

4-27-42

S.H. Hahn

4-16-42.

This memo was originally prepared as an A.V.O. from Mr. F.H. Danner,

present Curtis Laboratories representatives at N.A.C.A., to Mr. R.A. Drury, dated

line be initiated at Curtis.

and economical. It is recommended that an experiment along these

agreed that the computing set up at N.A.C.A. is quite satisfactory

to this arrangement, it is recommended in some detail. It is generally

believed for such work. The whole situation at N.A.C.A. which depends

on electronic accuracy and speed. The computing work at N.A.C.A.

engineering applications usually done well before average

general average for men and particularly, that men who have good

aptitude retiring as women is, in general, somewhat higher than the

same time reducing the cost. It is known that the client does

order to increase the accuracy and speed of such work while it is

at computers as is set up in the benefitting department at Curtiss

It has been proposed that a group, or several persons, of professionals

SHEARWALL

April 24, 1942.

To: Mr. R. A. Darby  
Subject: Computing Group Organization & Practices at N.A.C.A.  
Reference: (a) Conferences with Mr. Herrnstein, Mr. Miller,  
Miss Tucker, Mr. Dearborn, Mr. Valentines, etc.

Purpose of  
Memo

For possible use in instituting a similar group for the general benefit of the Curtiss-Wright Engineering personnel (in particular, Flight Test, Aerodynamics, Wind Tunnel and Structures), we have made some inquiries about the present set-up of the Computing Group, which seems to work very successfully, here at the L.W.A.L. of the N.A.C.A.

Original NACA  
Set-up

The idea and organization of the computing section grew most rapidly within the last two years, when the number of computers nearly doubled. Although there are approximately 75 computers now as compared with about 450 engineers (total employees at L.W.A.L. at Langley Field is somewhat over 1000), there was at first no opposition to the plan so that it began with only a handful of members. The first organization was conducted as a computing "pool", much as a typing pool. All the work to be turned out at that time was sent to this central pool, because there was some saving in equipment and the facilities for teaching and delegation of each type of work could be done most efficiently in this way.

Present  
Set-up

Now that the idea has won general acclaim, the "pool" has decreased in size, but there are now individual computing groups attached to each Section (such as Aerodynamics, Physical Research, etc.), and each Section has several groups (consisting of about an average of three computers) attached to each Tunnel or Laboratory. Some tunnels have as many as ten computers while others have one computer who often devotes a part of her time to typing and secretarial duties. This is a rather recent innovation, developing from the desire of the L.W.A.L. to formalize their work and reports more than it has in the past. To this end the computers have been urged to attend evening classes in such subjects as mechanical drawing and typing. These classes are open to the public at the local high school. Most of the data and charts now obtained in any of the Sections is printed in a neater and more uniform manner than the former free-hand and often pencilled and hurried data sheets.

The central pool still does the overflow work from the various sections, or that from small Sections or individuals not having a computer permanently assigned to them. The central pool also serves as a training center and personnel supply station, since from the greater variety of its work, a trainee's ability can better be judged and guided to best advantage there.

Group Organization

Each section has a head computer, but this designation is not very formal, and it is not necessarily an indication of her earning a greater salary, especially among the smaller groups. A large Section is apt to have an acknowledged head computer, however, who is recognized as such by salary and authority. Her duties, besides including the usual computing work, consist of the delegation of the work items, and the laying out of a program and method of work on each project sent to her section. It is generally felt that the ability of the head computer in the direction of delegating responsibility and getting the most volume of work from her available group is the predominant factor in the efficiency and general working atmosphere of the whole group.

Personnel

The personal qualifications for these computers are not very rigid. These computers are all women who have obtained their jobs through Civil Service. Some entered merely through the "unclassified" or no-examination-required type of application, the selection being made merely on the basis of stated education and experience. Even in this case the candidates were chosen, it seems, from lists with various designations, for example - Engineering aid, which rarely requires a sort of general intelligence tests. The girls who operate the Comptometers have usually passed a proficiency test in that type of machine, and they are usually not college graduates. There is ample room for their talents, however, because the volume of work often necessitates computers who can perform the routine machine operation with great speed, but who need not have much logical insight into what the results should be or how they should check, etc.

The heads of the groups are college graduates, as are the majority of all the computers. Preference is given to those with major interests in mathematics or science (preferably physics), but of late these restrictions are being lowered so that one college course in mathematics has been accepted as qualifying. A good number of the computers are former school teachers. Their ages may average near 21, but there are a surprising number nearer 30 years old. There is no restriction because of marriage; in fact, some of the computers are wives of the engineers of various classification here at N.A.C.A.

Equipment

What opposition there seemed to have been toward establishing the computer groups was directed mostly toward the expense of the computing equipment. The automatic computing machines and comptometers cost over \$500.00 each, while they may not even be available today. The automatic calculator is usually the Friden or Marchant, while the comptometer was the Comptometer (Trade Name). The computers were also furnished with 20 inch (log-log duplex) slide rules. Each computing section has one slide rule at least, but in some sections (such as one case where a section contains three girls) each of the computers has one.

The \$1,440 post-tuition carriages take the title of "Dunlop, Dunlop", while the better salaried post-tuition carriages take the title of "General Correspondence". The new computer with colloquial brain cost \$1620. While the H.A.C. (2300) and C.H.C. (1260), there is a general arrangement now (the processor) but there seem to be two individual post-titles (H.A.C. and C.H.C.) but the former has preference over the latter. A Head Computer earns \$2000. (as does the Head Instructor who is braggart). Finally a Computer would be the title corresponding to the H.A.C. and E.T.C. and E.T.C. would be the title corresponding to the H.C.C.

At the present time, they will now be paid for 8 hours overtime in addition to the normal working day. The ceiling seems to be overlength, however, that is private industry. Of course, they will now be paid for 8 hours overtime in addition to the normal working day. The ceiling is amount of overtime to be delivered to receive \$600. However double this amount of overtime is delivered to receive \$800, and the difference had not been settled as yet. One or two head girls who have civil service sub-protection salary. One of these who are

The salary range is between \$1440 and \$1620 (which is the standard and 1/2 procedure best runs, now one of the companies can do 3 runs in 1/2 procedure and industrial experience is being wasted and threated by glad to admit that, where he need to take a day to work up back wages repeatedly elections, Mr. Hemmingson himself, for example, has done more than any other to do work more steadily and consistently than any woman. That is due to large measure to the feeling among the engineers that public are doing what they want to do that enough experience that they want to do. In other words, the engineers admit that they want to do what they want to do. From calculation detail to overcome any impediment to its operation by increasing the number of workers, it is calculated that enough repetition of this experience in 20 years to allow the engineers to do what they want to do. It is the other large expense item is the interest of the pension fund, which

Each company taking section has one light-table for tracing purposes, there are not very elaborate units in general. A set of fine-place legs, a few scales, trammels and punch cameras.

Light-table takes and drawings made available to all so provided at different times would tend to be of this more versatility type. The engineer probably be better done in the usual business machine. The engineer does not have the ability to work independently of the employer and also means of obtaining, and for the type of organization which has the same methods of calculating salaries. They point out the case of several of this type of work. The section heads have a decided desire to make

or the other is thus usually based on the continuous designation, as is observed in about two weeks of less, the employer for one man and adding and subtracting gradually. The automatic calculating machine has the advantage of automatically making the same time. The engineer has the advantage of automatically making the same time. Operations partly on the automatic calculating machine in the first place about three months (ranging to sixteen), the man performs all the work. Computer has preference in the operation of a computer (which makes despatch of the computers for some time to do this job, the man

The selection of the calculating machine is usually left to the

Types of  
Work

There is a large amount of simple calculation required in the work here at N.A.C.A. Most tunnels have means for taking photographs of banks of nearly a hundred manometers at a time. The computers read off the liquid levels and complete the analysis. On the other hand, some of the calculations are sent to the computers in the form of complicated formulas which necessitate a knowledge of trigonometry and sometimes of mathematics involving the calculus. In general, however, the group head would reduce this more complicated work down to tabular form requiring rather routine operations before it would be given to the machine operator. Most of the work coming from the engineers is accompanied by a memo of calculating instructions or word-of-mouth explanations. The computers in any one section soon learn what the usual type of calculation required of them would be. Special data sheets and forms are usually available for the more common calculations.

The concensus of all employees here at the N.A.C.A. is that the plan is very effective and satisfactory.

R. H. Cramer

RHC/gcd

CC: Messrs. Child, R.E.  
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